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(28) Feed premix and production method therefore.
 (29) A relatively dry, thermally stable, feed premix comprising a pelletized mixture of a physiologically acceptable carrier, for example, a grain flour, and one or more enzymes, is produced by mixing the ingredients, reacting the mixture to absorb the enzyme or enzymes into the carrier, and pelletizing the reacted mixture.

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US-A-3 898 131 (P.A. HAHN et al.) * Column 7, lines 23-25; column 8, claims 1-3 *	1,7,10 A 23 K 1/165	
X	POULTRY SCIENCE, vol. 65, no. 1, 1986, pages 72-77, Champaign, US; M.J. ENDY et al.: "Application of a simple radiol gel diffusion assay for endo-beta-glucanase activity in dietary enzyme supplements"	1,6,7 A 23 K 1/00	
X	US-A-3 701 830 (B.W. WEINRICH et al.) * Column 1, abstract; column 4, lines 49-60 * --- AU-A- 548 773 (D.J. KINGSTON et al.) * Claims 1,5,8,13-15,17; page 15, lines 9-12; examples 1,9,10 *	1,4,6,7 1,6,7 A 23 K	TECHNICAL FIELDS SEARCHED (Int. Cl. 4) ---
X	GB-A- 644 988 (R.P. DUNMIRE) * Page 1, lines 30-40, 43-51, 62-73, 81-88 * Page 3, lines 105-115 *	1,7 4,5 1,6,7	A EP-A-0 105 051 (THE QUAKER OATS CO.) * Claims 1,3,5,6,10 *
A	EP-A-0 113 626 (SANDERS) * Page 8, lines 1-5; page 9, claims 1,6 --- US-A-4 218 437 (G. HILLER) * Column 3, lines 48-58 *	1 1,7	D,A The present search report has been drawn up for all claims
			THE HAGUE DEKIEREL M.J. 21-04-1989 Examiner Date of completion of the search Place of search
			CATEGORY OF CITED DOCUMENTS T : theory or principle underlying the invention E : earlier patent documents, but published on, or X : particularly relevant if taken alone Y : particularly relevant if combined with another D : document cited in the application L : document cited for other reasons A : member of the same family, corresponding P : intermediate document O : non-patent disclosure



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Category	Citation of documents with indication, where appropriate, of relevant passages	Relevant to claim	
	CLASSIFICATION OF THE APPLICANT (Int. Cl. 4)	CLASSIFICATION OF THE CITATION (Int. Cl. 4)	
A	ARCHIV FÜR GEFLÜGELKUNDE, vol. 42, no. 5, 1978, pages 183-193, Eugen Ulmer GmbH & Co., Stuttgart, DE; H. VOGT et al.: "Proteasen im Geflügelfutter" * Page 188, Left-hand column, paragraph 1; * Page 192, right-hand column, paragraph 1; ----- page 192, right-hand column, summary *	1,6,7	
<p>The present search report has been drawn up for all claims</p> <p>The place of search Date of completion of the search Examiner</p> <p>THE HAGUE 21-04-1989 DEKEIREL M.J.</p>			
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<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document Z : document cited for other reasons D : document cited in the application E : earlier patent document, but published on, or T : theory or principle underlying the invention F : member of the same family, corresponding document G : non-written disclosure H : technological background I : document of the same category P : intermediate document</p>			

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35 The high temperature damages a part of the grain (feed), which becomes difficult to digest. Other parts of the grain become easier to digest, but this may again be achieved

costly and energy-consuming.

36 A short residence time requires high temperature and adequate moisture. In this case, the temperature typically may be 120°C. The costs of generating this temperature are very high, both in terms of running costs and in the purchasing of equipment. Today it is typical to use expanders or extruders for this part of the process, and this is very

37 sterilisation, i.e., the directive that all feed must be heated to a minimum temperature of 80°C and kept at this temperature for a sufficient period of time.

25 Today's equipment in animal feed factories is not capable of handling the required sterilisation, i.e., the directive that all feed must be heated to a minimum temperature of 80°C and kept at this temperature for a sufficient period of time.

30 Eggs are a major source of salmonella infections. The problem has now become so great that in many places on the continent it is not possible to buy soft-boiled eggs or fried eggs as the heat treatment of the yoke is inadequate. Similarly, meat may be infected with salmonella and the consumption thereof may have a disabling result.

35 Today, researchers have identified 2000 variants of salmonella bacteria ranging from the relatively harmless to the deadly.

40 The invention relates to such proportions that the EU has directed that all animal feed is to be heated to a minimum of 80°C. From research into the problem complex, it is known that heating to a temperature of 80°C without a residence time will not render

45 the salmonella bacteria harmless, as this requires a combination of temperature, time and moisture and residence time.

50 The invention relates to a method of sterilising granulate and particulate material, wherein steam is added to the material to heat it to sterilisation temperature and the material is maintained at this temperature for a necessary residence time.

55 Method of sterilising granulate and particulate material and means in a mixing apparatus

Thus, there is a need to find a simpler way to "sterilise" animal feed than the methods used today, both as regards operations and in terms of investments.

By using a lower temperature for a longer time without the damaging side-effects that the high temperature causes.

for the material in the residence vessel. According to the invention, the vessel advantageously has a discharge device in the bottom region thereof. The discharge device may be a horizontal feed screw and may to advantage be progressive, in order thereby to maintain a desired horizontal free surface

costs in order to bring the temperature back down to ambient temperature. apparatus/conditioning and will involve only slightly higher costs related to a somewhat higher temperature, but considerably lower costs for heating than, e.g., expanders which supposedly raise the temperature of the product to 120°C, which in turn requires higher costs in order to bring the temperature back down to ambient temperature.

The invention will help considerably to reduce investments. Since, in today's plants the product is already heated, the energy used for this will be channelled into the mixing time cannot be used. The running costs would be very high in such a case.

expanders in order to elevate the temperature sufficiently, because a prolonged residence common in feed factories today, a major investment must be made in expanders or against salmonella is obtained. If such protection is to be obtained by using the plants pellet press may be dispensed with, and thus overall in terms of investments the sum cascade mixers and pellet presses can be dispensed with. The cascade mixer on the required is lower than today's investment, and in addition the protective equipment against isotope salmonsella is obtained. If such protection is to be obtained by using the plants cannot be used. The vessel is very simply arranged like, since existing space in the factory can be used. The vessel is very simply arranged under the mixing apparatus. Moreover, the invention also means that silos before

the sterilisation of the feed by means of heating to a sterilisation temperature by supplying steam to the mixing apparatus, where the granulate or particulate material is agitated to a fluid state in connection with the mixing that takes place therein. In terms of costs, the invention will result in great advantages for animal feed factories and the like, since existing space in the factory can be used. The vessel is very simply arranged under the mixing apparatus. Moreover, the invention also means that silos before

an elevator to a silo, a conditioning system and a pellet press. where a typical diagram would be a weighing system, a mixing apparatus, a receptacle, according to the invention, it is proposed that the housing should have an inlet for the discharge opening.

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6, 7.

in the mixing apparatus I can fall straight down, through the opened discharge openings 6, 7 there is provided a residence vessel 10 into which the product processed in direct connection with the lower part of the mixing apparatus around the discharge

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opening 5 can, after mixing, be discharged through the discharge openings 6, 7 open discharge position so that the product poured into the housing 4 through the intake slitudes 8, 9 which in Fig. 1 are indicated with broken lines and are swinging down into an bottom region. The discharge openings 6, 7 can be opened and closed by means of

The mixing apparatus I has an intake opening 5 and two discharge openings 6, 7 in the

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mixing process.

particulate material with which the housing 4 is filled, and fluidise the product during a motor-powered shafts provided with blades or paddles which beat the granulate or that is described in EP 219471. A mixing apparatus of this kind has two horizontal apparatus housings 4. The mixing apparatus I may, for example, be of the general type The drawings show a mixing apparatus I having two horizontal paddle units 2, 3 in the

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Fig. 2 is a vertical section 90° to the section in Fig. 1.
Fig. 1 is a vertical section through a means according to the invention; and

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drawings, wherein:

The invention will now be described in more detail with reference to the schematic

vessel is at least 1.7 times that of the housing.
It is especially advantageous according to the invention if the volume of the vessel is larger than that of the housing. It is particularly advantageous if the volume of the vessel is at least 1.7 times that of the housing.

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Agitator means may include two interacting horizontal paddle rotors.

portion of the housing.

The stream inlets are advantageously located according to the invention in a lower

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thermally insulated, or have external heating or a combination of both.
According to the invention, it is advantageous if both the housing and the vessel are

The invention provides the advantage that it is possible to use a mixing apparatus which is already an integrated part of a feed production and which exists in several different types. The only departure is that the apparatus should be insulated and partly heated to avoid cold surfaces which may cause the salmonella bacteria to survive. Similarly, a vessel 10 must be provided where the product can be kept for a minimum of three minutes, so that the necessary residence time in the system is obtained. In the plant 35

electrically or by using a steam loop.

The plant may to advantage be insulated, as indicated by means of the reference numeral 14, and optionally externally heating (not shown) may also be provided, in addition to or instead of insulation. The heating may, for example, take place

through the opening 12 by means of feed screws 11 and preferably concurrently with the sterilisation. After the desired residence time in the vessel, the product is conveyed out through the opening 12 by means of feed screws 11 and preferably concurrently with the mixing and sterilisation. The product that has been transferred to the vessel 10 will remain in the vessel 10 for a period of time necessary to obtain of the requisite quantity of product which comes from the mixing apparatus.

When mixing and sufficient heating for sterilisation have been accomplished, the steam also means that desired moisture is added to the material in the mixing apparatus. The plant in the drawings functions in the following manner. The granulate or particulate material (not shown) is fed into the mixing apparatus 1, 4 through the intake opening 5. The sluces 8, 9 are closed. The agitators 2, 3 are used to provide an agitation of the filled material in order to mix it in a commonly known manner. During the mixing a fluidisation of the granulate or particulate material is produced. Steam is introduced through the nozzles 3 to heat the fluidised material. The introduction of steam also means that desired moisture is added to the material in the mixing apparatus.

The mixing apparatus 1 is provided with a plurality of steam nozzles 13 through which steam can be fed into the mixing apparatus. These steam nozzles are arranged advantageously in the lower region of the mixing apparatus beneath the agitators 2, 3.

The residence vessel 10 has a funnel-shaped lower region wherein at the bottom there is provided a progressive feed screw 11 which conveys the product out of the residence vessel 10 through an opening 12.

to the product.
The steam may be overheated to better balance the quantity of moisture which is added

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time in the system.
before the vessel has been sufficiently emptied. This is to guarantee a correct residence mixing apparatus, or alternatively prevents the quantity added from entering too soon from being emptied to a level that is too low before the next quantity arrives from the vessel is advantageous to provide a level control in the vessel 10, which prevents the vessel

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sufficient, uniform temperature increase in the product.
mixing of the steam into the feed or product is achieved, in order thereby to obtain the requirement is that it must be capable of fluidising the product, so that a very efficient As mentioned, the mixing apparatus may be one of many different types. The

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respect to a sterilisation of the feed product.
temperature, residence time and moisture in order to satisfy the requirements made with according to the invention, it is possible in a simple manner to obtain a desired

35 means (2, 3) include two interlocking horizontal paddle rotors.
 A means according to one of the preceding claims 2-5, characterised in that the agitator

6.

30 A means according to claim 4, characterised in that the horizontal feed screw (11) is
 5. progressive.

25 4. A means according to claim 3, characterised in that the discharge means (11) is a
 horizontal feed screw.

3. 20 A means according to claim 2, characterised in that the vessel (10) in a bottom region
 thereof has a discharge means (11) for the material in the vessel.

7. 15 A means according to claim 2, characterised in that the vessel (10) in a bottom region
 the material in the housing, and that the housing discharge opening (6, 7) is attached to a
 vessel (10) for receiving material from the housing (4) through the discharge opening (6,
 material, characterised in that the housing (4) has an inlet (13) for the supply of steam to
 means (2, 3) provided inside the housing for fluidising a granulate or particulate
 intake opening (5) in the housing, a discharge opening (6, 7) in the housing and agitator
 A means in a mixing apparatus, which mixing apparatus includes a housing (4), an

2.

10 1. A method of sterilising a granulate or particulate material wherein steam is added to the
 heating the quantity of material is made to fall straight down into the second chamber.
 a fluid state in the first chamber whilst it is heated by a supply of steam, and that after
 residence time before discharge, characterised in that a quantity of material is agitated to
 transferred directly to a second chamber and is maintained therein for a necessary
 material in order to heat it to sterilisation temperature in a chamber and after heating is
 A method of sterilising a granulate or particulate material wherein steam is added to the

A means according to one of the preceding claims 2-6, characterised in that the volume of the vessel (10) is greater than the volume of the housing, preferably at least 1.75 of the volume of the housing.

7.